

DETERMINATION OF THE PERCENTAGE OF SHALE IN AGGREGATE

1. SCOPE: This test method describes a procedure for determining the percentage by mass of shale in the plus 1/4 in. or plus 3/8 in. portion of aggregates. Shale is defined to be a fissile rock that is formed by the consolidation of clay, mud or silt, has a finely stratified or laminated structure, and is composed of minerals essentially unaltered since deposition.
2. APPARATUS:
 - 2.1. Balance: The balance or scale shall be sensitive to within 0.1 percent of the mass of the sample to be tested except that graduations less than 1 gram will not be required.
 - 2.2. Sieves: A 3/8 in. and a 1/4 in. sieve conforming to AASHTO M 92.
 - 2.3. Miscellaneous: Equipment suitable for washing, drying and storage of aggregates (buckets, pans, spatula, cloth, etc.).
 - 2.4. Other equipment, which should be used when available, shall consist of the following:
 - 2.4.1. Mechanical Shaker: For separation of the aggregate over the 1/4 in. sieve or 3/8 in. sieve.
 - 2.4.2. Sample Splitter: A sample splitter for the reduction of large samples.
3. SAMPLE:
 - 3.1. Field samples shall be obtained in accordance with AASHTO T 2.
 - 3.2. The minimum field sample mass and the mass of the damp test portion are listed in the following table. The sample shall be reduced in size by splitting or quartering, as applicable, in accordance with AASHTO T 248. The test portion is obtained by washing the reduced sample over a 1/4 in. sieve for sizes No. 78, No. 8, No. 9-M, and fine aggregate. All other coarse aggregate sizes are washed over a 3/8 in. sieve. The material retained on the sieve is used for testing. (See Section 6)

NOMINAL MAXIMUM SIZE	MINIMUM MASS OF FIELD SAMPLE	MINIMUM MASS OF TEST PORTION
3/8 in. or less	10 lb.	500 grams
1/2 in.	20 lb.	1500 grams
3/4 in.	30 lb.	2500 grams
1 in. to 1 1/2 in.	60 lb.	3000 grams
1 3/4 in. to 3 1/2 in.	80 lb.	9000 grams

4. PROCEDURE:

- 4.1. Spread the wet portion on a sufficient area of work bench so that the individual particles may be carefully inspected. The work bench should be covered with Kraft paper or similar material to prevent loss of aggregate particles.
- 4.2. Use the fingers or a spatula and visually classify the test portion into two separate piles as either shale or non-shale aggregate.

Note: Maintaining the material in a damp condition will aid in visually classifying and separating shale from the test portion, as shale will generally dry more slowly and thus should appear darker than the other particles.

- 4.2.1. Shale will be identified by one or more of the following characteristics: (1) easily broken or deformed between the fingers (2) splits easily along laminations (3) has a slick or greasy feel when wet. Material from the Waldren, Eden, New Albany or other similar shale formations will count as shale.
- 4.2.2. Do not randomly pick the shale out of the test portion, but systematically handle each particle of aggregate and place it in its respective classified pile.

NOTE: The test portion may be soaked in water for 24 hours before testing, when deemed appropriate by the tester. (See PRECAUTIONS – Section 6)

- 4.3. Surface dry each pile of aggregate by the use of a cloth, or other acceptable means, and weigh separately to the nearest gram, recording the mass of shale as W_s and the mass of non-shale aggregate as W_g .

5. CALCULATIONS:

5.1. Calculate the percentage of shale as follows:

$$\text{Percent of Shale} = \frac{W_s}{W_s + W_g} \times 100$$

Where:

W_s = mass of shale

W_g = mass of non-shale aggregate

6. PRECAUTIONS: Some soft shale will break up easily when exposed to water, when this occurs it will be necessary to dry sieve the sample first, then pick out the soft shale. The sample can then be washed and further checked for additional shale.

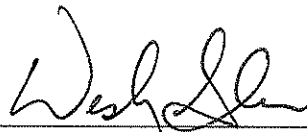
7. REPORT:

7.1. Report the results to the nearest 0.1 of a percent.

7.2. The Division of Materials will be the final authority in all disputes involving shale content determinations.

7.3. When test results are obtained that do not fall within specification limits, the failure must be verified. The unused field sample is to be tested in the same manner as the original test sample. When the original and the verification test results are reasonably close they are to be averaged to obtain a single reportable test result. When the two test results vary considerably further investigation will be necessary. Investigation may include checking test equipment, reducing field sample to test sample practices, methods of calculations and/or obtaining an additional field sample to test.

APPROVED



DIRECTOR
DIVISION OF MATERIALS

DATE

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